Preliminary results --

IBS beam evolution studies

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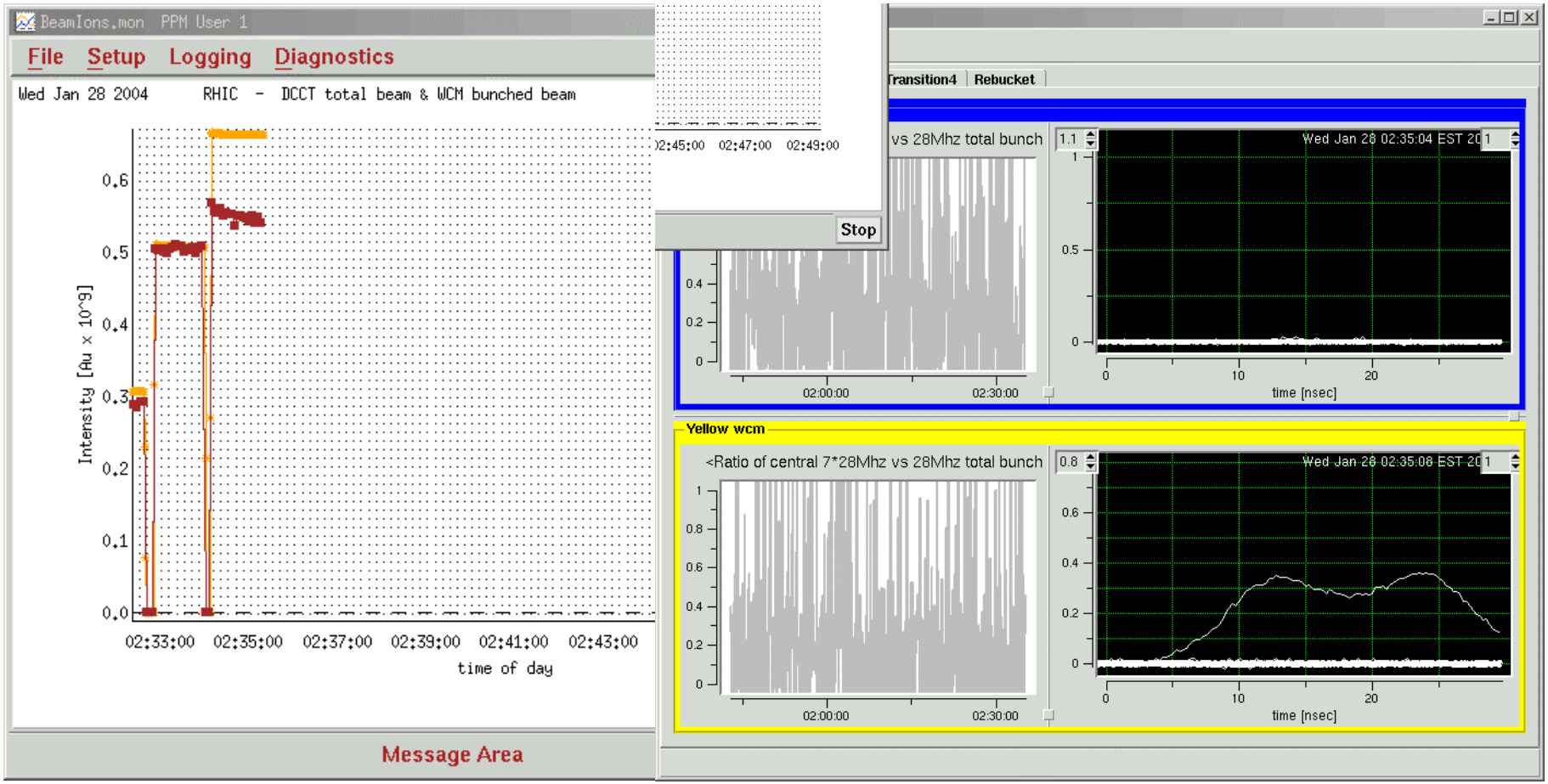
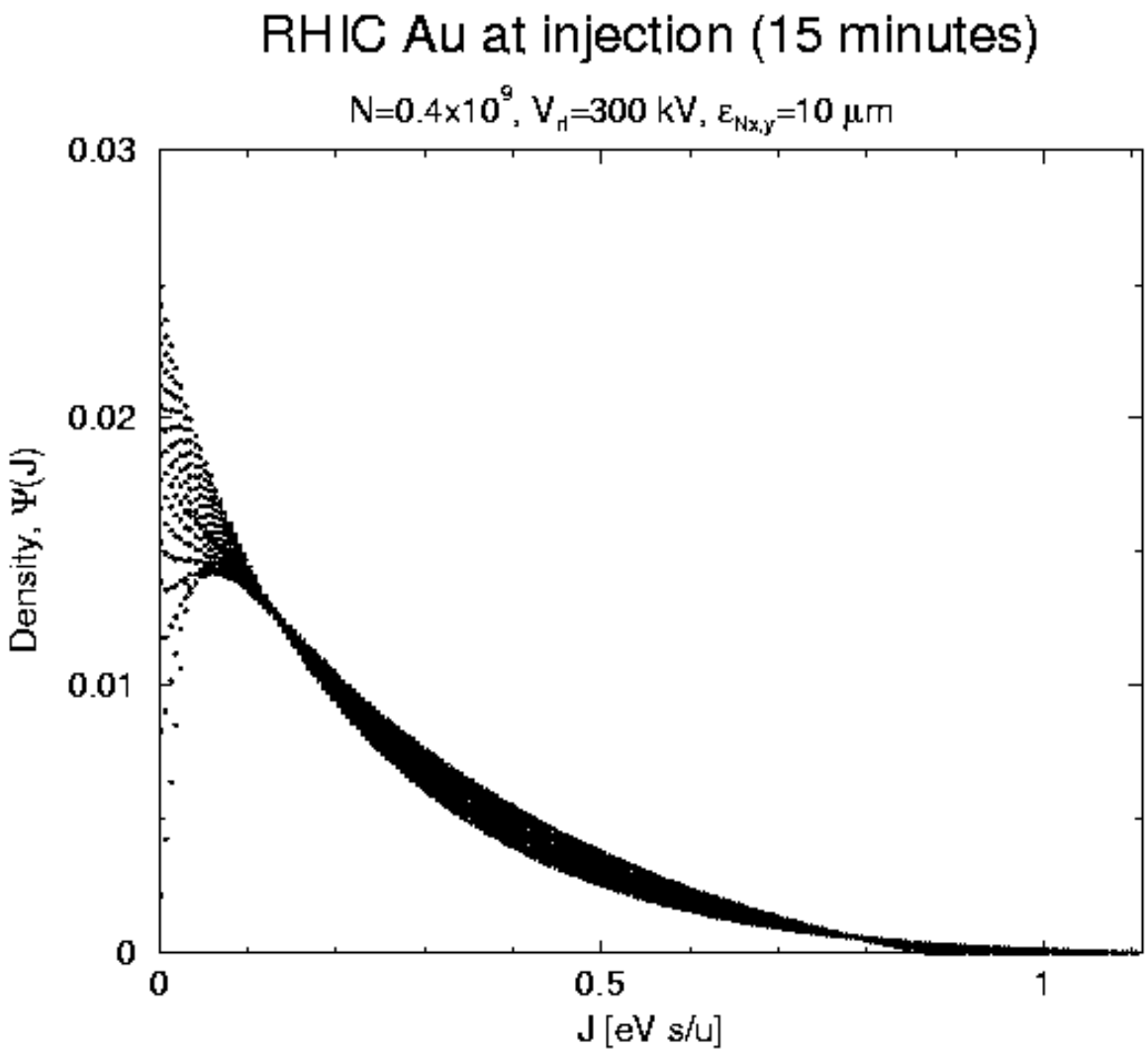
IBS observable quantities

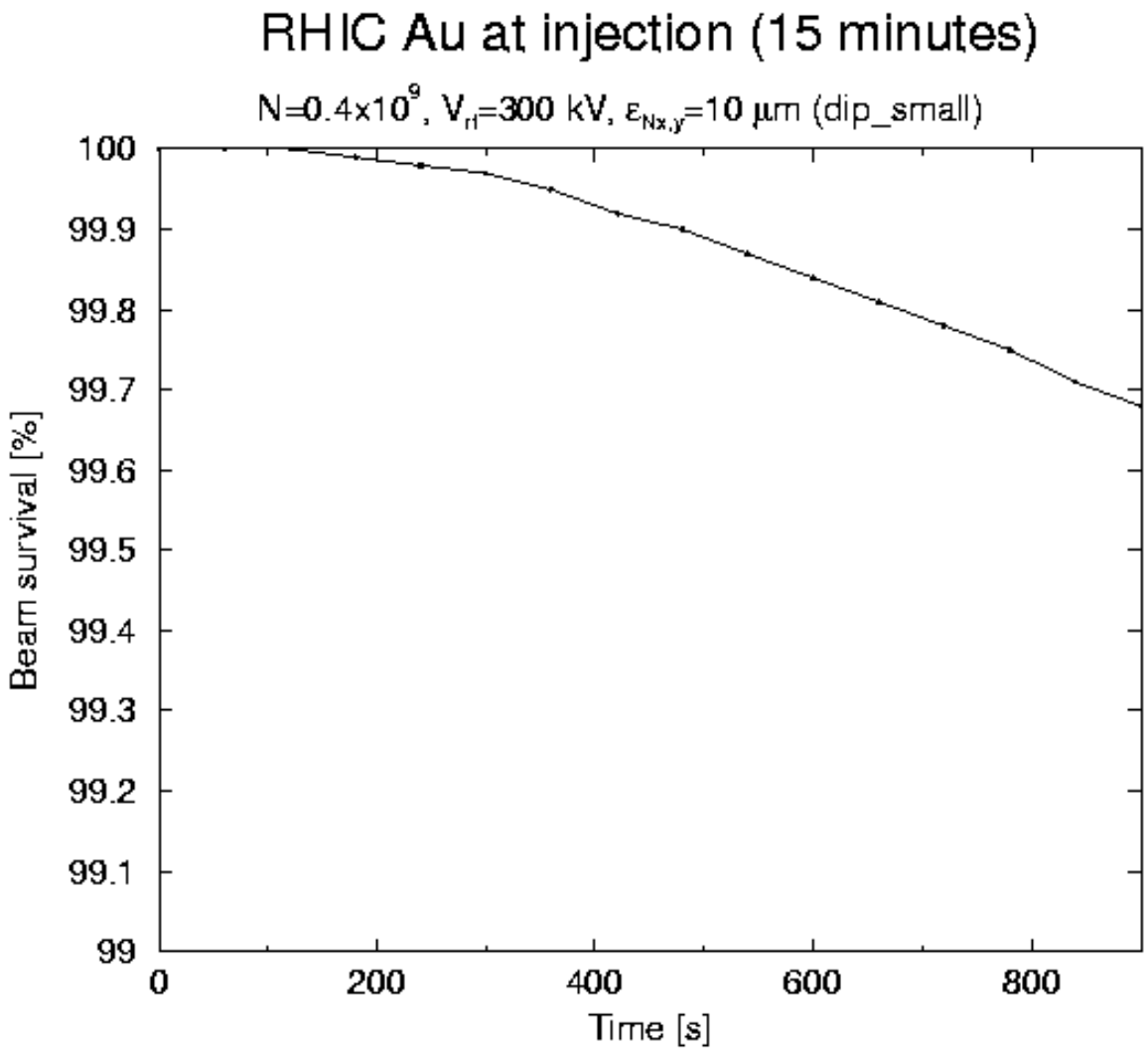
- rms beam size (bunch length, transverse emittances)
  - Many early studies performed
  - Need to single out IBS from other processes
  - (beam-beam, tune kicker, Landau cavity, dual RF, RF noise …)
- Beam loss
  - Amount of debunched beam (escaping RF bucket)
  - Amount of DCCT loss
- Beam profiles
  - Hollow bunch profile evolution
  - Asymptotic distribution

Hollow-bunch study at injection

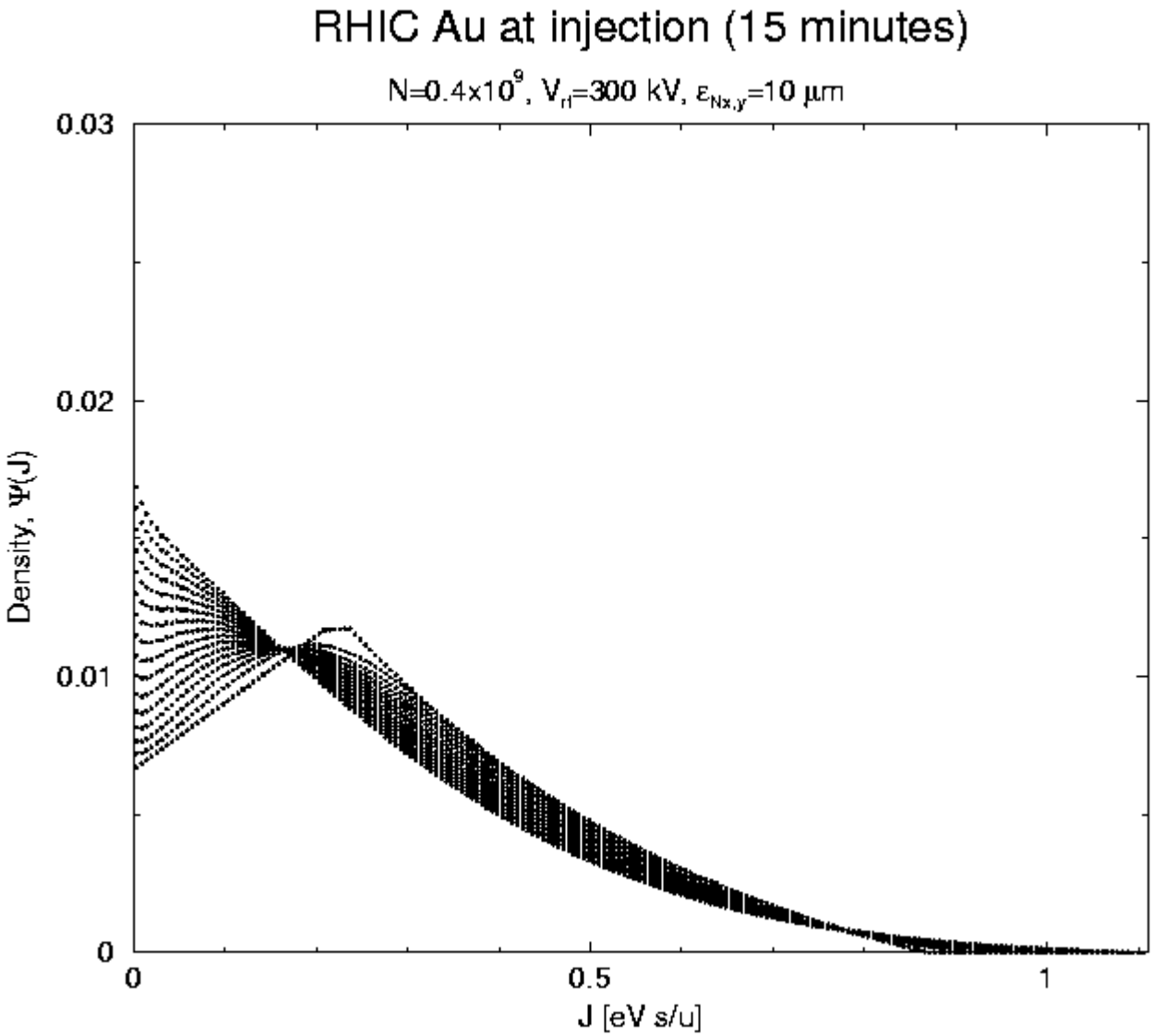


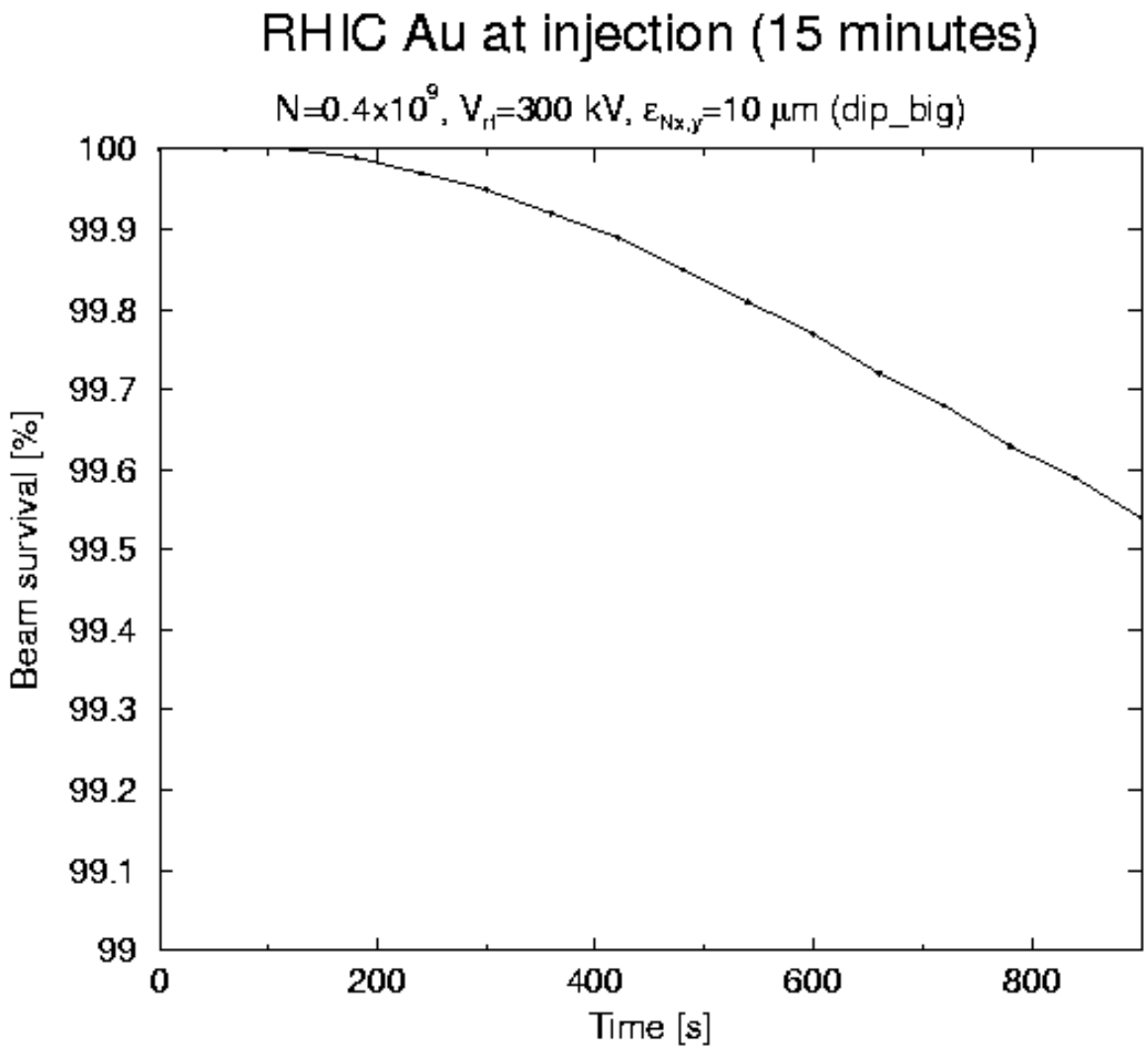
Hollow bunch (1)



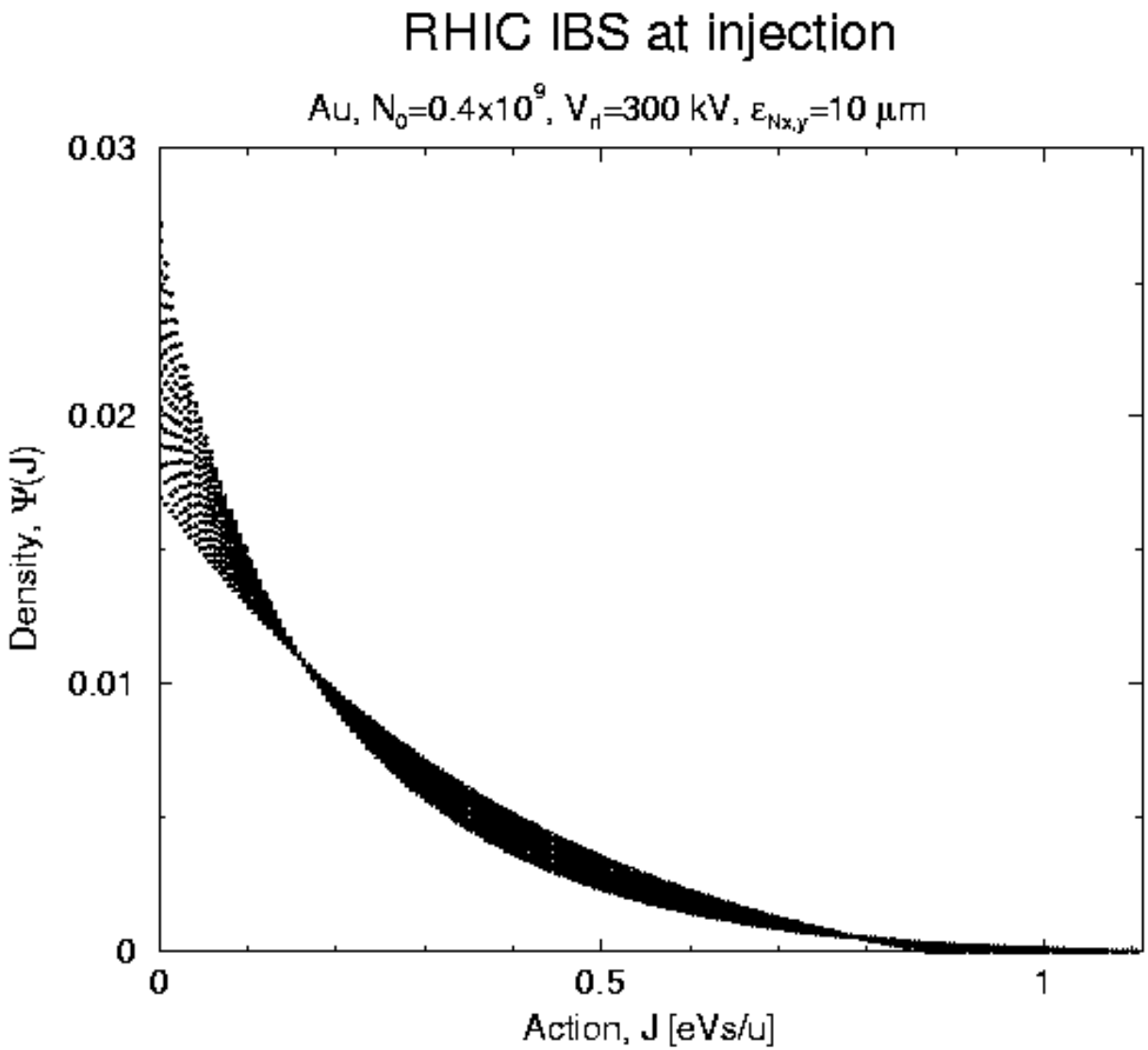

RHIC Au at injection (15 minutes)
N=0.4x10^9, V_rf=300 kV, ε_Nx,y=10 μm (dip_small)
Beam survival [%]
100
99.9
99.8
99.7
99.6
99.5
99.4
99.3
99.2
99.1
99
0
200
400
600
800
Time [s]

Hollow bunch (2)

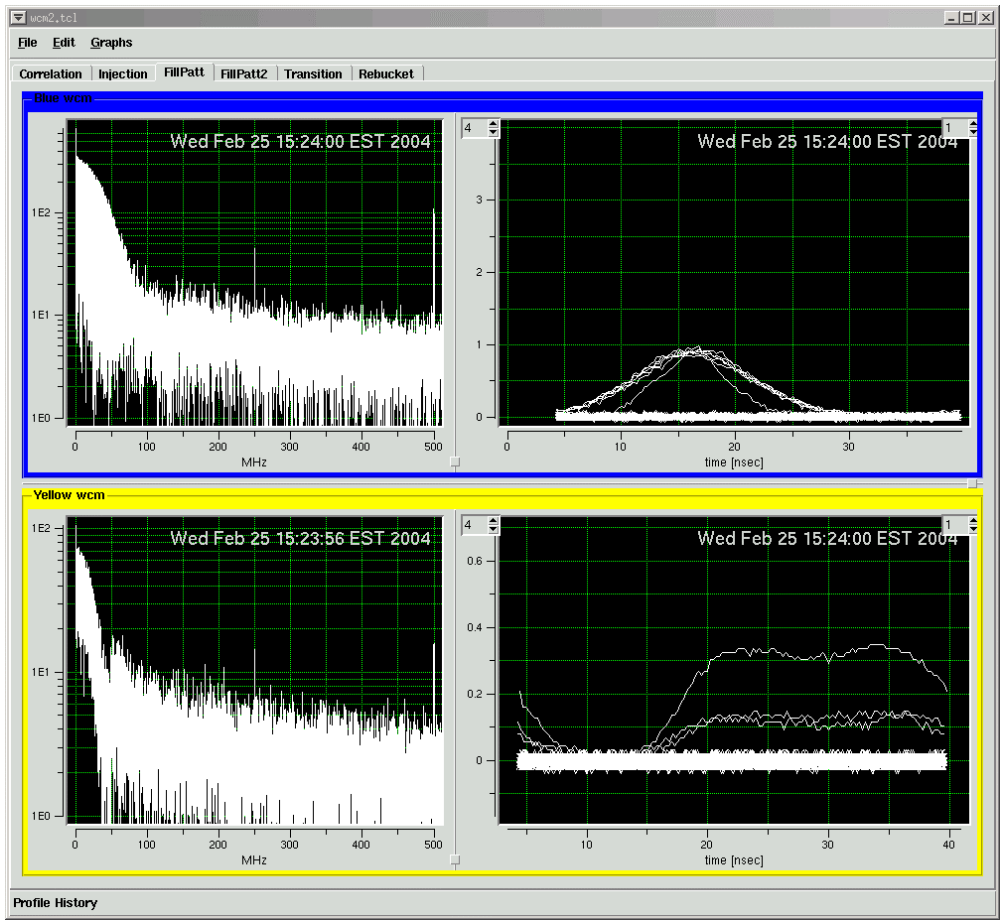



RHIC Au at injection (15 minutes)
N=0.4x10^9, V_rf=300 kV, ε_Nx,y=10 μm (dip_big)
Beam survival [%]
100
99.9
99.8
99.7
99.6
99.5
99.4
99.3
99.2
99.1
99
0
200
400
600
800
Time [s]

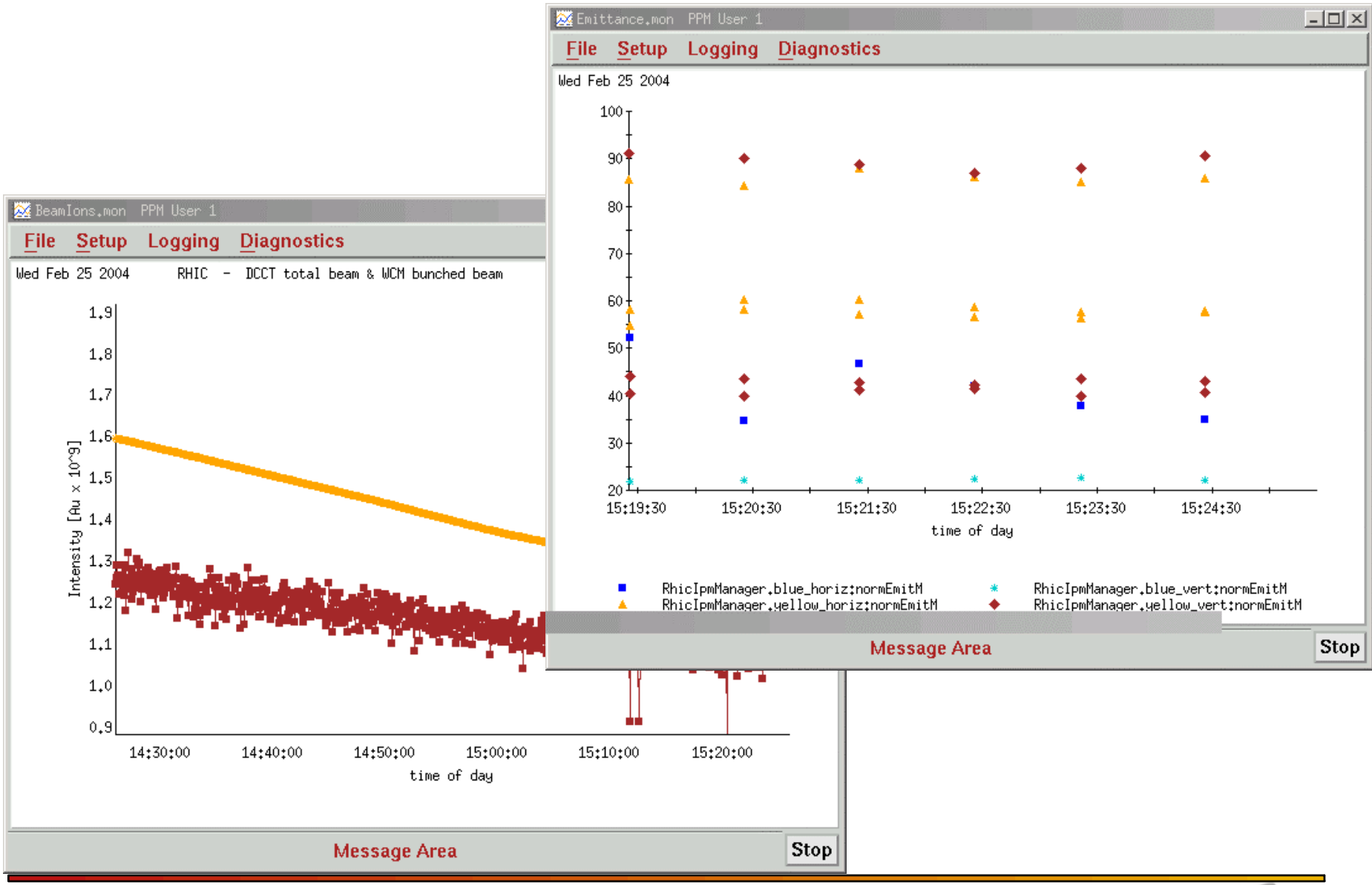
Convention case



Hollow-bunch study at store



Non-IBS beam loss observed



What's done so far

- Injection: hollow bunch created by mis-phased injection
  - Qualitative agreement (data not all analyzed): hole is filled in less than 15 minutes
  - IPM performance was poor during the study
- Store: hollow bunch creased by jumping RF phase 100 degrees
  - Used 28 MHz RF system alone in the yellow ring
  - The emittance was too big (80 mm mr); tune kicker on?
  - Hollow bunch remained its shape for near one hour (good)
  - Hard to explain beam loss (6.5% in 23 minutes) by IBS
    - » Transverse scraping?
    - » M. Brennan: RF noise is higher in yellow than blue

What needs to be done

- Store measurement (1):
  - Use both yellow and blue rings, 28 MHz RF alone
  - Inject with bunches of uneven intensities
  - No re-bucketing; jump RF phase (~80 degrees?) in both blue and yellow as soon as the beam is at store
  - Turn off tune kicker, minimize IPM readings (every 2 minutes?), turn down Landau cavity, beam-beam …
  - Record WCM, IPM, DCCT
- Store measurement (2):
  - Same as above, except no RF phase jump
- Injection measurement (1):
  - Same misphasing hollow bunch study as previous performed, except with working IPM and with bunches of uneven intensity
- Injection measurement (2):
  - Same as above, except no RF phase jump